

Chemistry – Year 12 Organic and Physical Chemistry Curriculum

	Content (Intent)	Links to prior learning	Skills and Assessment (Implementation)	Expected Learning Outcomes (Impact)
Term 1 – Physical chemistry	Atomic structure - Fundamental particles - Mass number, atomic number and isotopes - Electron configurations - Ionisation energies - The mass spectrometer	Y10 atomic structure	Skills: Maths skills – calculating RAM, rearranging equations Literacy Assessment: End of topic test covering content from this topic and previous topics. Test includes multiple choice, structured, closed short answer, and open response questions	- determine the number of fundamental particles in atoms and ions using mass number, atomic number and charge - explain the existence of isotopes - Describe and explain how a TOF mass spectrometer works - interpret simple mass spectra of elements - calculate relative atomic mass from isotopic abundance, limited to mononuclear ions. - Describe electron configurations of atoms and ions up to $Z = 36$ in terms of shells and sub-shells (orbitals) s, p and d. - Use ionisation energy data to identify an unknown atom and to justify the spd model
	Bonding - Ionic bonding - Covalent bonding - Metallic bonding - Shapes of molecules - Intermolecular forces	Y10 Bonding	Skills: Maths skills – bond angles Literacy Assessment: End of topic test covering content from this topic and previous topics. Test includes multiple choice, structured, closed short answer, and open response questions	- Describe and explain the bonding present in a substance - Determine the shape and bond angle(s) of covalent molecules - Explain properties of familiar and unfamiliar substances using their knowledge and understanding of structure and bonding

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Term 2 - Organic chemistry	Introduction to Organic Chemistry • Naming organic compounds • Empirical, molecular, general, structural, displayed, skeletal formulae • Structural isomers • Stereo isomers	Previous Y12 work on covalent bonding Y11 alkanes, cracking, air pollutants	Skills: Maths skills – Empirical, molecular and general formulae Literacy Assessment: End of topic test covering content from this topic and previous topics. Test includes multiple choice, structured, closed short answer, and open response questions	• Draw and interpret structural, displayed and skeletal formulas for given organic compounds • name organic compounds limited to chains and rings with up to six carbon atoms each • define the terms structural and stereo isomers • draw the structures of chain, position and functional group isomers • draw the structural formulas of E and Z isomers • apply the CIP priority rules to E and Z isomer
Term 2 - Organic chemistry	Alkanes • Cracking • Free radical substitution reaction • Combustion	Previous Y12 work on covalent bonding and organic chemistry Y11 alkanes, cracking, air pollutants	Skills: Maths skills – Empirical, molecular and general formulae Literacy Assessment: End of topic test covering content from this topic and previous topics. Test includes multiple choice, structured, closed short answer, and open response questions	• Describe and explain the reactions of alkanes, including cracking, halogenation, complete and incomplete combustion • Describe and explain the economic importance of processing crude oil by fractional distillation and cracking Discuss the environmental impact of combustion and how this can be reduced

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Term 3 - Organic chemistry	• Halogenoalkanes •	Previous organic chemistry topics	Skills: Practical Skills Maths skills Literacy Assessment: End of topic test covering content from this topic and previous topics. Test includes multiple choice, structured, closed short answer, and open response questions	• outline the nucleophilic substitution mechanisms of the reaction of h-alkanes with OH⁻, CN⁻ and NH₃ • explain why the carbon–halogen bond enthalpy influences the rate of the nuc sub reaction. • Outline the mechanism for elimination of h-alkanes to form alkenes • Describe and explain the affect of CFCs on the ozone layer
	Alcohols • Naming and classification of alcohols • structure and bonding • properties • ethanol production •	Previous organic chemistry topics	Skills: Practical Skills – RP5 Distillation of a product from a reaction Maths skills Literacy Assessment: End of topic test covering content from this topic and previous topics. Test includes multiple choice, structured, closed short answer, and open response questions	• explain the meaning of the term biofuel • justify the conditions used in the production of ethanol by fermentation of glucose • write equations to support the statement that ethanol produced by fermentation is a carbon-neutral fuel and give reasons why this statement is not valid • outline the mechanism for the formation of an alcohol by the reaction of an alkene with steam in the presence of an acid catalyst • discuss the environmental (including ethical) issues linked to decision making about biofuel use • classify alcohols as primary, secondary or tertiary • write equations for oxidation reactions of primary and secondary alcohols (equations showing [O] as oxidant are acceptable)

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				• explain how the method used to oxidise a primary alcohol determines whether an aldehyde or carboxylic acid is obtained • use chemical tests to distinguish between aldehydes and ketones including Fehling's solution and Tollens' reagent. • outline the mechanism for the elimination of water from alcohols
	Alkenes • structure and bonding • combustion • electrophilic addition mechanism • reaction with halogens • reaction with hydrogen halides • reaction with concentrated sulphuric acid • reaction with water • addition polymerisation	Previous organic chemistry topics Y11 Organic chemistry	Skills: Practical Skills Maths skills Literacy Assessment: End of topic test covering content from this topic and previous topics. Test includes multiple choice, structured, closed short answer, and open response questions	• outline the electrophilic addition mechanism for the reaction of alkenes with halogens, hydrogen halides and sulphuric acid • explain the formation of major and minor products by reference to the relative stabilities of primary, secondary and tertiary carbocation intermediates. • draw the repeating unit from a monomer structure • draw the repeating unit from a section of the polymer chain • draw the structure of the monomer from a section of the polymer • explain why addition polymers are unreactive • explain the nature of intermolecular forces between molecules of polyalkenes •

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Term 4 – Organic Chemistry	Chemical analysis - Chemical tests for functional groups - Mass spectrometry - Infra red spectroscopy	Y12 Mass spectrometry Previous organic chemistry topics Y11 chemical analysis topic	Skills: Practical Skills – RP6 – use chemical tests to identify unknown compounds Maths skills – calculating R _f Literacy Assessment: End of topic test covering content from this topic and previous topics. Test includes multiple choice, structured, closed short answer, and open response questions	- identify the functional groups using reactions in the specification - use precise atomic masses and the precise molecular mass to determine the molecular formula of a compound. - use infrared spectra and the Chemistry Data Sheet or Booklet to identify particular bonds, and therefore functional groups, and also to identify impurities.
Term 5	Revision	All y12 topics	Skills: Practical Skills Maths skills Literacy Assessment: Paper 2 mock - 1hour 30mins	To consolidate knowledge and understanding of the course content and exam skills.

Resources and/or activities to support learning

Resource	Where to find it	Why?
Textbook	Kerboodle: www.kerboodle.com	Use for research, to consolidate class work, complete summary questions
CGP student books	CGP A level chemistry Student book – available to order through the school at the start of each academic year	Use for research, to consolidate class work, complete summary questions
Chemistry hand book	You should have a copy of this – ask you teacher if you don't	Useful course information, study tips, revision tips, opportunities to reflect on your progress
Practical guide	You should have a copy of this in your practical folder – ask you teacher if you don't	Use to prepare for and review methods for required practicals which will be assessed in end of topic assessments and papers

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Teacher powerpoints, worksheets and exam question packs	Teams	Use to consolidate class work, complete homework tasks and questions
AQA website	http://www.aqa.org.uk/subjects/science/as-and-a-level/chemistry-7404-7405	specification, past papers and mark schemes
Physics and Maths tutor	AQA A-level Chemistry Revision - PMT (physicsandmathstutor.com)	It saves you time making your own revision notes. Answering questions allows you to apply what you have learned and identify gaps in your knowledge. Also has notes, flash cards, questions and videos for the required practicals
Chem guide	www.chemguide.co.uk	very detailed explanation of all parts of the course with some excellent summary questions and answers. This is not specific to AQA so it contains some things you don't need to know, but it's a really good place to start if you are looking for good explanations of the content
Chem revise	www.chemrevise.org	Online revision guides for all chapters
A level chemistry.co.uk	www.alevelchemistry.co.uk	Notes, exercises, tests and "exam papers"
Org Chem 101	www.orgchem101.com	You can generate quizzes to test yourself on naming compounds (note that the prefix "n" is added for "normal" straight chain molecules, which is not required at A level) and mechanisms